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ABSTRACT

A study examined the effectiveness of a spatial learning strategy, the Graphic Post Organizer, implemented for an extended period of time. Subjects, approximately 150 eleventh-grade students enrolled in a "regular level" American History course at a combined upper-middle, middle, and working class suburb of Chicago, Illinois, were separated into control (50 students in 2 classes) and experimental (100 students in 4 classes) groups. Subjects in the experimental group received instruction in the use of the Graphic Post Organizer and used the strategy for an 8-week period, while the subjects in the control group received instruction in the SQ3R strategy (Survey, Question, Read, Recite, and Review). Pretests and posttests tested student comprehension and recognition of relationships between concepts in unfamiliar passages adapted from their history textbook. Results indicated that: (1) 80% of the students appeared to have mastered strategy usage at an 80% level at the end of the 2-day training period; (2) many students did not transfer strategy implementation from guided practice to independent practice; and (3) while subjects in the control group achieved a higher mean score on the pretest than did the treatment group, the treatment group achieved a higher adjusted mean score on the posttest than did the control group. Findings suggest that spatial strategies assist students in increasing their text comprehension and that modeling of the strategy is an appropriate method for the teaching of spatial strategies. (Two tables of data, 2 figures representing Graphic Post Organizers, a list of Graphic Post Organizer terms for the branches of American government, and 13 references are attached.) (RS)

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The Use of a Spatial Learning Strategy to Enhance Reading Comprehension of Secondary Subject Area Text

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INTRODUCTION

The need for strategies to improve reading comprehension for students at the secondary level has been well established. Joseph Vaughan recommends that teachers adopt the educational goal to assist all students to become accomplished readers, that is readers who attempt to improve their understanding by applying learning strategies to their reading and monitoring their comprehension (Vaughan and Estes, 1986). One technique which teachers can utilize to improve students' reading comprehension is the modelling of the use of spatial learning strategies (Derry, 1989).

Spatial learning strategies are systems of graphic representations of information. To implement spatial learning strategies, students are taught to organize the concepts of a learning task so as to create a diagram that shows relationships between concepts. The efficacy of the implementation of spatial learning strategies upon reading comprehension of text materials has been consistently demonstrated by researchers such as Dansereau (1980), Armbruster and Anderson (1984), Mayer, Dyck & Cook (1984), Vaughan (1984), and Barron & Schwartz (1984).

Spatial learning strategies are based upon the hypothesis that the active organization of information into diagrams or

schema facilitates the encoding of incoming information. The schematic graphic structures also serve as vehicles for the retrieval of knowledge from long-term memory (Holley & Dansereau, 1984a). The effectiveness of spatial learning strategies lies in the provision of a vehicle for students to recognize the relationships between concepts as they are represented in texts.

Further research is needed to address additional questions regarding spatial learning strategies. Can secondary students master the heuristics of spatial learning strategies to increase their reading comprehension? Can these students be taught such strategies within a reasonable period of time? Can spatial learning strategies be taught within the existing classroom curriculum in secondary schools?

This research addressed some of these issues by examining the effectiveness of the Graphic Post Organizer, a spatial learning strategy developed by Barron (1981). In previous investigations, effects of the Graphic Post Organizer upon reading comprehension have been examined after two forty-five minute sessions, and one ninety minute session. In this study, the Graphic Post Organizer was implemented for an eight-week period to enable measurement of the effects of extended strategy usage. The study evaluated the effects of strategy implementation by students on their comprehension of text in a common subject area.

The Graphic Post Organizer (Barron, 1981) has been chosen as the cognitive strategy for this study because of its apparent suitability for implementation in a high school setting. The hypothesis was formed that the Graphic Post Organizer could be implemented within existing curricula, rather than the specialized strategy courses required for learning other spatial learning strategies, such as Networking (Holley & Dansereau,1984b), Schematizing (Camstra & Van Bruggen (1984), and Mapping, (Armbruster & Anderson, 1984). The teaching time for the heuristics of the Graphic Post Organizer appeared to require only a few classroom sessions, after which students could apply the strategy to existing coursework.

An advantage of the Graphic Post Organizer was the feasibility of teaching the strategy within the context of existing secondary classes. For example, the strategy appeared to be suitable for social science courses, because the Graphic Post Organizer structure depicted the kinds of relationships often contained in secondary social science texts: main idea, parallel subtopics, and subordinate details.

With the Graphic Post Organizer, the subject area textual materials which most high school students have to comprehend are organized into graphic representations to assist student learning. The procedure facilitates learning because the secondary student himself forms the graphic diagrams which

depict an schematic organization of the concepts which he is assigned to learn. Students therefore form a meaningful learning set to enhance their learning processes.

REVIEW OF LITERATURE

Literature regarding cognitive strategies has emphasized the organization of materials to be learned into meaningful networks or schema by the learner. The concept of students actively processing textual materials into schema for encoding and subsequent retrieval forms the basis of the present structural approach to the development of learning strategies (Mayer, 1980). The active role of the learner in organizing new information is viewed as a crucial element of recent strategies. The schematic, structural framework strategies, such as Networking, (Holley & Dansereau, 1984b), Mapping (Armbruster & Anderson, 1984), and ConStruct (Vaughan, 1984), emphasize the reorganization of new information into network-like schema or diagrams.

The Graphic Post Organizer was developed over a period of time by Barron (1981). The Graphic Post Organizer indirectly evolved from Barron's earlier research, in which he investigated Ausubel's Advanced Organizer, which was based upon the theory that existing knowledge is a major variable in the successful learning of new information. The Graphic Post

Organizer as developed and researched by Barron (1981) is a graphic schematic form of diagram which students can utilize to create an organization of relationships between concepts about which they are reading. The GPO has been tested both in college and high school classrooms in brief treatment periods. In a high school setting, Barron's treatment produced effective results in a test designed to identify the existence of relationships between terms contained in a given 3000 word passage on mental health (Barron & Stone, 1974). In a college setting, the strategy was found to produce significant effect upon the students' ability to recognize the existence of relationships between terms in a review session of the content of a methods course in reading (Barron and Schwartz, 1984).

STATEMENT OF THE RESEARCH PROBLEM

This research supplemented Barron's studies and expanded the investigation regarding the Graphic Post Organizer. To examine the implementation of the Graphic Post Organizer in secondary curriculum and instruction, this research project addressed certain questions: Can the Graphic Post Organizer be implemented within existing secondary school curriculum? Can secondary students master the use of the Graphic Post Organizer after a brief training period? Can the Graphic Post Organizer assist secondary students to increase their reading comprehension of text?

METHODS OF RESEARCH

Subjects

The subjects for this research were approximately 150 students in the eleventh grade in a combined upper middle, middle and working class suburb of Chicago. The students for this study, with an average age of 17 years, were enrolled in a year long course in American history, which was required for graduation. These students were placed in what the school district termed regular level classes, that is, classes composed of students who have not been placed into gifted, advanced or low level classes. Nevertheless, pretest scores revealed that a wide range of achievement and performance remained in the regular level classes.

The subjects were enrolled in six pre-existing classes in American history. Four of these classes (n = 100) received the GPO treatment. Two classes (n = 50) made up the control group. These six classes were taught by three teachers, two classes per teacher. The teachers were homogeneous in their teaching effect according to an analysis of their average class achievement scores on the previous two years' criterion reference testing in their regular level American history courses.

Design

This project was a quasi-experimental research design

that consisted of two groups, treatment and control, with pretests and posttests, and other measures. As described by Cook and Campbell (1979), a quasi-experimental design is called for when randomization cannot be employed in the selection of treatment and control subjects or groups in field research.

Treatment

Students in the treatment group learned to apply the Graphic Post Organizer strategy to text taken from their history textbooks. Control students received instruction in use of the Survey, Question, Read, Recite, Review technique (SQ3R), but otherwise studied their history text using traditional instructional techniques. Details of the GPO treatment and control groups' activities will be described in the procedures section of this paper.

Instrumentation

GPO Initial Seatwork. Student GPO structures completed at the end of the two-day training period were collected and evaluated on a ten point per GPO basis. Five points were possible for the quantity of terms placed into the GPO structure, thus giving credit for engagement on task. An additional possible five points were given for the reasonable placement of terms into a coherent GPO organizational frame. Reasonable placement was determined as the placement of a term that could be logically explained within the factual context

of the period in American history.

Two initial GPOs were scored to determine the extent of student initial mastery of the Graphic Post Organizer strategy. Student scores were categorized and computed as either above or at 80% correct (a range of 16 to 20 points) or below 80% correct (a range of 14 to 0 points).

The GPO Score. The GPO Score was developed by the researcher to create a measure of the quality of student strategy implementation. The researcher collected and coded classroom assignment papers on which students had completed GPOs for designated topics over the eight-week period.

Students formed a possible eleven GPOs, each of which were coded on a scale of 1 to 10 points. There was thus a high possible score of 110 points for the GPO Score.

Text Passage Pretest and Posttest. A pretest which tested student comprehension and recognition of relationships between concepts in an unfamiliar passage adapted from their textbook in American history was administered to the treatment and control groups. The pretest consisted of twelve items, and was evaluated with a reliability of .79 according to Chronbach's Alpha test for reliability. The test was readministered as a posttest eight weeks later to both the treatment and control groups.(Both the passage and test are located in the Appendix).

Procedures

Instructional events included presentation of the Graphic Post Organizer to the treatment group by modelling how to construct a GPO using Barron's introductory chart of matter subdivided into categories of animal, vegetable and mineral (see Figure 1). The instructor used responses elicited from students to organize a GPO for the terms listed on the blackboard.

After teacher modelling, students participated in a guided practice of creating a GPO for the three branches of the American government and the major offices which are categorized into those three parallel divisions. A GPO shell for this topic is presented as Figure 2. This GPO was created on the blackboard with student participation. Students worked from a handout of terms to be utilized in the formation of a GPO. Corrective feedback was given orally and by writing only reasonable responses into the GPO being created on the blackboard.

On the second day of treatment, the instructor presented additional modelling of the basic format of the GPO. Guided practice in the use of the GPO was conducted by forming students into groups of four to create a GPO for the causes of the First World War. The researcher and classroom teachers provided corrective feedback while circulating to answer questions and to observe student progress. Students also completed a GPO for the entrance of the United States into the war. The GPOs were later collected, evaluated and returned to

students for additional corrective feedback.

In the strategy treatment period, schematic shells were created for each of the remaining units of the course. These shells contained headings, and some parallel subtopics in the GPO structure. Each shell GPO was accompanied by a list of terms, chosen by the researcher and the treatment teachers, for students to place into a GPO formation.

To prevent a Hawthorne-like effect of feelings of neglect on the part of the control group (Cook and Campbell, 1979), the researcher conducted a two-day period of alternative treatment, which consisted of training students in the SQ3R technique applied to the reading of their history text.

In the eighth week of treatment, students in the treatment and control groups were administered an identical posttest to test for their comprehension and recognition of relationships between concepts contained in a text passage. Students in the treatment classes were instructed to read the passage and to form a GPO for the text by using the schematic shell given to them. After fifteen minutes, the students were re-administered the posttest. In the control classes, students were reminded of the SQ3R technique and instructed to read the text and to study the passage for a test. After fifteen minutes, the same time allocated to the treatment group, treatment students were given the posttest on the passage.

RESULTS

Multiple methods of statistical analyses were employed in this study because of the quasi-experimental design advised for multi-classroom research. ANCOVA analysis was employed to discern whether significant differences due to treatment existed between groups, while controlling for possible preexisting differences between groups through the use of pretests as covariates. Students for whom scores were missing were dropped from the analyses.

Student Mastery of the GPO Strategy within the Two-Day Training Period

This study sought to determine whether students could learn to construct a GPO during the two-day training period. Examination of student GPO Scores at the end of the two-day training period confirmed that students had mastered the basic heuristics of strategy usage. Sixty-two of seventy-six treatment students achieved sixteen or more points out of the possible twenty points on their corrected GPO papers. In other words, 80% of the treatment students attained an 80% level of mastery for strategy usage after two days of training.

Effects of the GPO upon Text Comprehension

This study examined whether the application of the Graphic Post Organizer strategy to a text passage at a secondary reading level would increase student comprehension of that text. An ANCOVA was conducted with the text posttest

as the dependent variable, the treatment condition as the independent variable, and the text pretest as a covariate.

As indicated in Table 1, the students in the control group achieved a higher mean score on the text pretest than did the treatment group. On the text posttest, however, the treatment group achieved a higher adjusted mean score than did the control group. The ANCOVA results, as shown in Table 2, indicated that the treatment had significant effect upon student comprehension of the secondary text passage at the .001 level of significance.

DISCUSSION AND CONCLUSIONS

Student Implementation of the Graphic Post Organizer Strategy

Students' initial learning and transfer of the strategy. Students appeared to have mastered strategy usage at the end of the two-day strategy training period. This training period consisted of two fifty-minute classroom sessions. This was of major interest, because Holley and Dansereau (1979) experienced difficulties when they attempted to reduce strategy training for college students to six hours, or two weeks of class time. Vaughan (1984) had trained high school students over a twelve-week period. The use of a two-day training period confirmed Barron and Schwartz's (1984) finding regarding strategy training time for the Graphic Post Organizer with high school students. It would appear that additional time would be beneficial, however, for extended guided practice prior to independent practice.

Researcher evaluation of the papers produced in those two days indicated the initial success that 80% of the students appeared to have achieved mastery of strategy use. Evaluations of papers produced as independent practice over the eight-week period, however, revealed that differential levels of student implementation of the Graphic Post Organizer strategy had occurred. Over 20% of the treatment group had achieved GPO Scores above 90%. Thirty-five percent of the

treatment group achieved mastery of the implementation of the GPO at the 80% level. Only 53% of the treatment group, however, implemented the Graphic Post Organizer at the traditional high school passing, or grade of C, level.

Many students evidently did not transfer strategy implementation from guided practice, in which the researcher continued to model strategy structure, elicit student responses and give oral feedback to students, to independent practice. In guided practice all students participated as a whole. Class attention was focused on the blackboard and on peer responses. That procedure appears to have assisted most students to attain a high performance level during the initial two-day training period. Some students, however, were not ready to implement the strategy without continued assistance.

Implications for the teaching of spatial strategies. The above findings would appear to affirm that modelling is an appropriate method for the teaching of spatial strategies. In addition, increased time spent in peer modelling and guided practice in strategy usage is recommended to facilitate continued student implementation of spatial strategies.

Strategy effectiveness upon text comprehension. One implication of the consistent findings that spatial strategies assist students to increase their text comprehension is that the Graphic Post Organizer could be used in classrooms as an encoding activity for the reading of texts. The implementation

of strategies such as the Graphic Post Organizer as a reading activity has not been carried out extensively in secondary classrooms for an apparent variety of reasons. Perhaps the most prominent reason is that students seldom read their text in the classroom in American history classes at the secondary level. Most text reading is assigned as homework, while class time is utilized for teacher lectures, teacher to student question and answer sessions, and student discussions. Student motivation to employ such strategies in completely independent practice outside the classroom structure probably would not be high without extensive motivational and self-regulation training.

The finding of a positive effect of the use of the Graphic Post Organizer upon student understanding of text passages, however, indicate that teachers could have students form such structural organizers while reading their textbooks in class. Small group or cooperative groups would be appropriate for such activities. Reading comprehension of subject area texts appear to benefit from the regular use of such strategy aides.

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Appendix

A: Tables.

B: Figures.

C: Passage text and passage pretest/posttest.

APPENDIX A

STATISTICAL TABLES

TABLE 1

Means, Adjusted Means and Standard Deviations for the Text Pretest and Posttest

Variable		Treatment	Control
Text pretest	X	7.600	9.000
	SD	1.431	1.359
Text posttest	X	9.747	9.250
	SD	1.498	1.464
	Adj. X	10.028	8.722

TABLE 2

ANCOVA Comparison between Treatment and Control Groups for the Text Posttest

Source	SS	MS	df	F	Sig.F
Within	185.13	1.6	112		
Pretest	116.56	116.56	1	70.52	.001
Treatment	38.85	38.85	1	23.50	.001

APPENDIX B

FIGURES

INTRODUCTORY GRAPHIC POST ORGANIZER

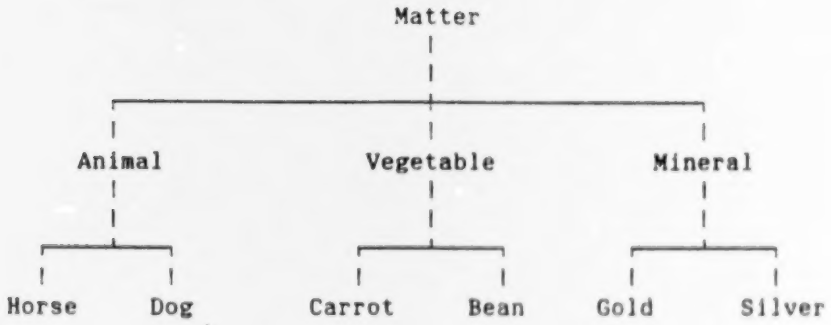
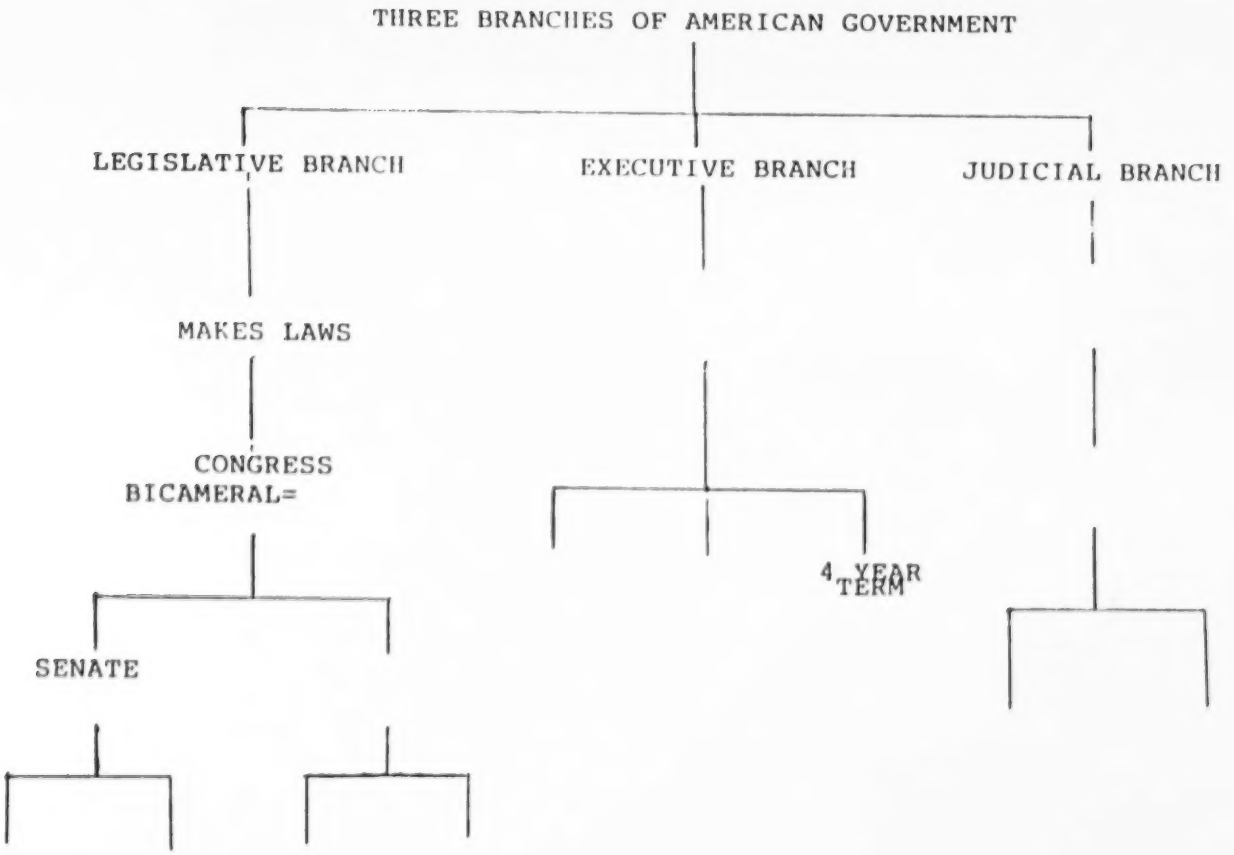


Figure 1. Example of an introductory graphic post organizer.

Figure 2. Shell graphic post organizer for the three branches of the American government.



GRAPHIC POST ORGANIZER

LIST OF TERMS FOR
THREE BRANCHES OF AMERICAN GOVERNMENT

LEGISLATIVE BRANCH	VICE PRESIDENT
JUSTICES	2 YEAR TERM
PRESIDENT	BICAMERAL
INTERPRETS LAWS	EXECUTIVE BRANCH
SUPREME COURT	4 YEAR TERM
SENATE	ADMINISTERS AND ENFORCES LAWS
6 YEAR TERM	TWO HOUSES
SENATORS	JUDICIAL BRANCH
MAKES LAWS	HOUSE OF REPRESENTATIVES
REPRESENTATIVES	CONGRESS
LIFE TERM	

Figure 3. Graphic post organizer terms for the three branches of American government.